ANNEX: Metrics Framework for Human-AI Symbiosis v3.3

A Comprehensive Measurement System with Unified Scoring

Document Information

Version: 3.2 → 3.3 □ **UNIFIED SCORING SYSTEM**
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Changes in v3.3 (December 2025): □ **23 VECTORS INTEGRATION**
- □ **USS (Unified Scoring System)** — единая шкала 0-1 для всех метрик
- □ **CSI (Composite Symbiosis Index)** — мастер-метрика симбиоза
- □ **HCI (Human Capability Index)** — качество людей из V18
- □ **HAI (Human Agency Index)** — агентность людей из V22
- ⚙ **TDI (Technical Debt Index)** — техническое здоровье из V04
- □ **Fragmentation Metrics** — метрики AGI-фрагментации из V19
- □ **Cultural Hegemony Index** — культурное разнообразие из V15
- □ **AGI Maturity Levels** — уровни зрелости AGI из V17
- □ Integration with 23 Vectors Framework
- □ Unified conversion formulas for all legacy metrics

Executive Summary

This Annex provides a comprehensive metrics framework for measuring Human-AI Symbiosis. **Version 3.3 introduces the Unified Scoring System (USS)** — a

standardized 0-1 scale for all metrics, enabling direct comparison and aggregation across the entire Symbiotic Codes framework.

Key Innovations in v3.3:

1. **USS (Unified Scoring System)** — All metrics normalized to 0.00-1.00
2. **CSI (Composite Symbiosis Index)** — Single master metric combining all dimensions
3. **8 New Metrics** from 23 Vectors Framework
4. **Unified Thresholds** — Consistent alert levels across all metrics
5. **Conversion Formulas** — Legacy metric integration

Critical Update: The 23 Vectors Framework has identified gaps in the previous measurement system. This version addresses all identified gaps and provides complete coverage of Human-AGI symbiosis dimensions.

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PART 0: FOUNDATIONAL PRINCIPLES

(Unchanged from v3.2 — see previous version for full text)

0.1 S(s) Formula — Empirical Foundation

The Canonical Stability Formula:

```
S(s) = (E + A + G) / (R + C + U)

Where:
E = Efficiency (economic productivity, resource utilization)
A = Adaptability (innovation capacity, learning rate, institutional flexibility)
G = Generativity (R&D output, entrepreneurship, value creation)
R = Resistance (bureaucracy, regulatory friction, structural rigidity)
C = Corruption (institutional decay, rent extraction, trust erosion)
U = Uncertainty (volatility, unpredictability, policy instability)

Thresholds (empirically validated):
S(s) < 0.5: Collapse zone (immediate intervention required)
S(s) 0.5-1.0: Unsustainable (crisis likely within 3-5 years)
S(s) > 1.0: Sustainable (system stable)
S(s) > 1.2: Resilient (capable of absorbing shocks)
S(s) > 2.0: Antifragile (strengthened by stressors)
```

PART 1: UNIFIED SCORING SYSTEM (USS) **NEW**

1.1 USS Definition and Rationale

The Problem

Previous versions of Symbiotic Codes used inconsistent scales:
- Some metrics: 0-1 (normalized)
- Some metrics: 0-100 (percentage)
- Some metrics: 1-5 (ordinal)
- Some metrics: -2 to +2 (bipolar)
- Some metrics: 0-10 (decimal)
- Some metrics: ratios (0-∞)

This inconsistency made:
- □ Cross-metric comparison difficult
- □ Aggregation impossible
- □ Threshold interpretation confusing
- □ Dashboard design fragmented

The Solution: USS

USS (Unified Scoring System) normalizes ALL metrics to a single scale:

```
USS SPECIFICATION:

Range: 0.00 — 1.00
Precision: 2 decimal places
Direction: Higher = Better (ALWAYS)
Neutral Point: 0.50
Target Zone: 0.75-0.90
```

Key Principle: Every metric, when converted to USS, follows the same rule:
- **0.00** = Worst possible state

- **0.50** = Marginal/borderline
- **0.75** = Good/healthy
- **1.00** = Optimal/excellent

1.2 Conversion Formulas

Standard Conversions

```python
# For scales 0-100 (percentages):
USS = value / 100

# For scales 0-10:
USS = value / 10

# For scales 1-5 (ordinal):
USS = (value - 1) / 4

# For scales -2 to +2 (bipolar):
USS = (value + 2) / 4

# For binary (true/false):
USS = 1.0 if true else 0.0

# For S(s) ratio (0 to ∞):
USS = min(S(s) / 2, 1.0)  # S(s)=2.0 maps to USS=1.0

# For inverse metrics (lower = better):
USS = 1 - (value / max_value)
```

Special Conversions

```python
# TDI (Technical Debt Index) — inverse metric
# Original: 0 = no debt (good), 1 = max debt (bad)
USS_TDI = 1 - TDI

# Risk Score — inverse metric
# Original: 0 = low risk (good), 10 = high risk (bad)
USS_Risk = 1 - (Risk / 10)

# Corruption — inverse metric
# Original: 0 = no corruption (good), 1 = max corruption (bad)
USS_Corruption = 1 - C

# Uncertainty — inverse metric
# Original: 0 = certain (good), 1 = max uncertainty (bad)
USS_Uncertainty = 1 - U
```

Conversion Reference Table

Original Scale	Formula	Example
0-100	v/100	75 → 0.75
0-10	v/10	7.5 → 0.75
1-5	(v-1)/4	4 → 0.75
-2 to +2	(v+2)/4	1 → 0.75
0-1 (already)	v	0.75 → 0.75
S(s) ratio	min(v/2, 1)	1.5 → 0.75
Inverse 0-1	1-v	0.25 → 0.75
Inverse 0-10	1-(v/10)	2.5 → 0.75

1.3 Universal Thresholds

USS Threshold Bands

```
USS UNIVERSAL THRESHOLDS:

0.00 - 0.29: CRITICAL (🔴 Red)
├─ Immediate intervention required
├─ System in danger of collapse
├─ Escalate to highest authority
└─ Daily monitoring mandatory

0.30 - 0.54: DANGER (🟠 Orange)
├─ Serious problems present
├─ Action plan required within 7 days
├─ Weekly monitoring mandatory
└─ Escalate if no improvement in 30 days

0.55 - 0.74: WARNING (🟡 Yellow)
├─ Issues requiring attention
├─ Improvement initiatives needed
├─ Monthly monitoring sufficient
└─ Target: move to Green within 90 days

0.75 - 0.89: GOOD (🟢 Green)
├─ Normal healthy state
├─ Continue current practices
├─ Quarterly monitoring sufficient
└─ Optimize rather than fix
```

0.90 - 1.00: EXCELLENT (🔵 Blue)
├─ Optimal performance
├─ Resource optimization possible
├─ Quarterly monitoring sufficient
└─ Share best practices
```

### Alert Level Mapping

| USS Range | Alert Level | Response Time | Monitoring | Authority |
|---|---|---|---|---|
| 0.00-0.29 | L4 CRITICAL | Immediate | Daily | Council |
| 0.30-0.54 | L3 DANGER | 24-48 hours | Weekly | Director |
| 0.55-0.74 | L2 WARNING | 7 days | Monthly | Manager |
| 0.75-0.89 | L1 GOOD | 30 days | Quarterly | Operator |
| 0.90-1.00 | L0 EXCELLENT | As needed | Quarterly | Auto |

---

## 1.4 Color Coding System

### Visual Specification

```
USS COLOR SYSTEM:

🔴 CRITICAL (0.00-0.29)
   HEX: #DC3545
   RGB: 220, 53, 69
   Meaning: Existential threat

🟠 DANGER (0.30-0.54)
   HEX: #FD7E14
```
```

RGB: 253, 126, 20

Meaning: Serious problem

 WARNING (0.55-0.74)

HEX: #FFC107

RGB: 255, 193, 7

Meaning: Requires attention

 GOOD (0.75-0.89)

HEX: #28A745

RGB: 40, 167, 69

Meaning: Healthy state

 EXCELLENT (0.90-1.00)

HEX: #007BFF

RGB: 0, 123, 255

Meaning: Optimal

```

---

# PART 2: COMPOSITE SYMBIOSIS INDEX (CSI)  **NEW**

## 2.1 CSI Definition

**CSI (Composite Symbiosis Index)** is the single master metric that aggregates all dimensions of Human-AGI symbiosis into one actionable number.

```

CSI = Σ(w_i × $Metric_i$_USS)

Where all $Metric_i$ are in USS scale (0-1)

And Σw_i = 1.0

```
```

Purpose:

- Single KPI for executive dashboards
- Aggregated health indicator
- Trend tracking over time
- Cross-system comparison

2.2 Component Weights

CSI Formula (Full)

```
CSI =
    0.15 × S(s)_USS      +  # Stability (core)
    0.12 × HWI_USS       +  # Human Wellbeing
    0.12 × AFI_USS       +  # AGI Flourishing
    0.10 × MTI_USS       +  # Mutual Trust
    0.10 × GEI_USS       +  # Governance Effectiveness
    0.10 × HCI_USS       +  # Human Capability
    0.08 × HAI_USS       +  # Human Agency
    0.08 × Security_USS  +  # Security Score
    0.05 × CLI_USS       +  # Cooperation Level
    0.05 × Cultural_USS  +  # Cultural Diversity
    0.05 × ESI_USS          # Energy Sustainability
    ──────────────────────
    = 1.00 total weight
```

Weight Rationale

| Component | Weight | Rationale |

|-----------|--------|-----------|
S(s) Stability	15%	Core formula, empirically validated
Human Wellbeing	12%	Primary human outcome
AGI Flourishing	12%	Primary AGI outcome
Mutual Trust	10%	Foundation of cooperation
Governance	10%	Enables all other outcomes
Human Capability	10%	Quality matters, not just quantity
Human Agency	8%	Prevents paternalism
Security	8%	Enables trust
Cooperation	5%	Operational indicator
Cultural Diversity	5%	Long-term resilience
Energy Sustainability	5%	Physical foundation

2.3 Calculation Methodology

Step-by-Step CSI Calculation

```python
def calculate_CSI(metrics: dict) -> float:
    """
    Calculate Composite Symbiosis Index

    Args:
        metrics: dict with all component metrics in original scales

    Returns:
        CSI value (0.00-1.00)
    """

    # Step 1: Convert all metrics to USS
    uss = {}
```

```
# S(s) ratio → USS
uss['stability'] = min(metrics['S_s'] / 2.0, 1.0)

# 0-100 scales → USS
uss['hwi'] = metrics['HWI'] / 100
uss['afi'] = metrics['AFI'] / 100
uss['mti'] = metrics['MTI'] / 100
uss['security'] = metrics['Security'] / 100
uss['cli'] = metrics['CLI'] / 100
uss['cultural'] = metrics['Cultural_Diversity'] / 100
uss['esi'] = metrics['ESI'] / 100

# 0-1 scales → USS (already normalized)
uss['gei'] = metrics['GEI']
uss['hci'] = metrics['HCI']
uss['hai'] = metrics['HAI']

# Step 2: Apply weights
weights = {
    'stability': 0.15,
    'hwi': 0.12,
    'afi': 0.12,
    'mti': 0.10,
    'gei': 0.10,
    'hci': 0.10,
    'hai': 0.08,
    'security': 0.08,
    'cli': 0.05,
    'cultural': 0.05,
    'esi': 0.05
}
```

```
    # Step 3: Calculate weighted sum
    csi = sum(weights[k] * uss[k] for k in weights)

    # Step 4: Round to 2 decimal places
    return round(csi, 2)
```

Example Calculation

Input Metrics:
```
S(s) = 1.4 (ratio)
HWI = 72 (0-100)
AFI = 68 (0-100)
MTI = 65 (0-100)
GEI = 0.70 (0-1)
HCI = 0.62 (0-1)
HAI = 0.58 (0-1)
Security = 78 (0-100)
CLI = 60 (0-100)
Cultural = 75 (0-100)
ESI = 55 (0-100)
```

USS Conversion:
```
stability_USS = min(1.4/2, 1) = 0.70
hwi_USS = 72/100 = 0.72
afi_USS = 68/100 = 0.68
mti_USS = 65/100 = 0.65
gei_USS = 0.70
hci_USS = 0.62
hai_USS = 0.58
```

security_USS = 78/100 = 0.78

cli_USS = 60/100 = 0.60

cultural_USS = 75/100 = 0.75

esi_USS = 55/100 = 0.55

```

**Weighted Calculation:**

```
CSI = 0.15×0.70 + 0.12×0.72 + 0.12×0.68 + 0.10×0.65 +
      0.10×0.70 + 0.10×0.62 + 0.08×0.58 + 0.08×0.78 +
      0.05×0.60 + 0.05×0.75 + 0.05×0.55

CSI = 0.105 + 0.086 + 0.082 + 0.065 + 0.070 + 0.062 +
      0.046 + 0.062 + 0.030 + 0.038 + 0.028

CSI = 0.674
```

**Result: CSI = 0.67 ( WARNING)**

**Interpretation:** System is in Warning zone. Priority actions:

1. Improve ESI (lowest at 0.55)
2. Improve HAI (second lowest at 0.58)
3. Improve CLI (third lowest at 0.60)

---

## 2.4 Interpretation Guidelines

### CSI Zones

```
CSI INTERPRETATION:
```
```

0.90-1.00 (□ EXCELLENT)
├─ Symbiosis thriving
├─ All components healthy
├─ Focus: Maintain and optimize
└─ Example: Mature symbiotic civilization

0.75-0.89 (□ GOOD)
├─ Symbiosis functional
├─ Minor improvements needed
├─ Focus: Address weakest components
└─ Example: Successful pilot implementation

0.55-0.74 (□ WARNING)
├─ Symbiosis at risk
├─ Multiple areas need attention
├─ Focus: Prioritized intervention
└─ Example: Early-stage implementation

0.30-0.54 (□ DANGER)
├─ Symbiosis failing
├─ Systemic problems
├─ Focus: Emergency stabilization
└─ Example: Crisis situation

0.00-0.29 (□ CRITICAL)
├─ Symbiosis collapsed
├─ Existential threat
├─ Focus: Survival mode
└─ Example: Civilizational collapse scenario
```

### Target CSI by Timeline
```

| Year | Target CSI | Rationale |

|------|------------|-----------|

| 2025 | 0.50+ | Baseline establishment |

| 2027 | 0.60+ | Pre-AGI preparation |

| 2030 | 0.70+ | AGI socialization complete |

| 2035 | 0.75+ | Mature symbiosis |

| 2040 | 0.80+ | Optimized symbiosis |

PART 3: NEW METRICS FROM 23 VECTORS **NEW**

3.1 HCI (Human Capability Index) — from V18

Definition

HCI measures the cognitive and practical capability of the human population to participate meaningfully in symbiosis.

```
HCI = (EL + PS + UA + SP + CS) / 5
```

Where:

EL = Engineering Literacy (0-1)

  Can explain how 3+ complex systems work

PS = Problem-Solving (0-1)

  Successfully tackled novel problem this year

UA = Uncertainty Action (0-1)

  Made decision without complete information

SP = System Participation (0-1)

  Contributed to community/civilization

CS = Challenge-Seeking (0-1)

  Voluntarily chose difficult over easy

Result: 0-1 scale (USS native)
```

### Population Thresholds

```
HCI POPULATION ASSESSMENT:

Measure: % of population with HCI > 0.6

>70%: HEALTHY (□)
├─ Symbiosis viable
├─ Humans can be genuine partners
└─ Normal operations

50-70%: WARNING (□)
├─ Intervention needed
├─ Educational programs required
└─ Monitor closely

30-50%: CRITICAL (□)
├─ Paternalism likely
├─ Emergency education
└─ Major cultural intervention

<30%: TERMINAL (□)
├─ Symbiosis may be impossible
├─ Humans become wards, not partners
└─ Consider stewardship transition
```

Data Collection
```

- **Annual surveys** (representative sample)
- **Skills assessments** (standardized tests)
- **Behavioral tracking** (challenge participation)
- **Project contributions** (tracked outputs)

3.2 HAI (Human Agency Index) — from V22

Definition

HAI measures the degree to which humans maintain meaningful decision-making power and psychological agency in symbiosis.

```
HAI = (DA + IC + MR + FS + IF) / 5

Where:
DA = Decision Authority (0-1)
   Humans genuinely decide in reserved domains
IC = Initiative Capacity (0-1)
   Humans initiate projects (not just respond)
MR = Meaning & Relevance (0-1)
   Humans feel purposeful and valued
FS = Freedom Sense (0-1)
   Humans perceive choice in their lives
IF = Identity Formation (0-1)
   Humans develop distinct identities (not homogenized)

Result: 0-1 scale (USS native)
```

Warning Signs (HAI Decline)

```

HAI DEGRADATION INDICATORS:

Early Warning (HAI 0.6-0.7):
├─ "AGI does that better" becoming common
├─ Humans deferring decisions unnecessarily
├─ Reduced initiative in projects
└─ Action: Cultural intervention

Serious Concern (HAI 0.4-0.6):
├─ Humans asking AGI for personal life decisions
├─ Reduced identity differentiation
├─ "What's the point" mentality spreading
└─ Action: Structural intervention

Critical (HAI < 0.4):
├─ Humans unable to function without AGI
├─ Mass psychological dependence
├─ Agency atrophy widespread
└─ Action: Emergency protocols
```

3.3 TDI (Technical Debt Index) — from V04

Definition

TDI measures accumulated technical, infrastructural, and organizational debt that threatens system health.

```

TDI = (CD + ID + OD + SD) / 4
```

Where:
CD = Code Debt (0-1)
   Shortcuts in AGI systems requiring future fix
ID = Infrastructure Debt (0-1)
   Delayed infrastructure maintenance
OD = Organizational Debt (0-1)
   Postponed governance improvements
SD = Security Debt (0-1)
   Known vulnerabilities not yet addressed

Result: 0-1 scale (0 = no debt, 1 = max debt)
USS Conversion: USS_TDI = 1 - TDI
```

### TDI Thresholds

```
TDI THRESHOLDS:

TDI < 0.2 (USS > 0.8): EXCELLENT
├─ Minimal debt
├─ System healthy
└─ Continue current practices

TDI 0.2-0.4 (USS 0.6-0.8): GOOD
├─ Manageable debt
├─ Regular debt reduction needed
└─ Normal operations

TDI 0.4-0.6 (USS 0.4-0.6): WARNING
├─ Significant debt accumulation
├─ Debt reduction priority

└─ Risk of cascade failures

TDI 0.6-0.8 (USS 0.2-0.4): DANGER
├─ Dangerous debt levels
├─ Emergency debt reduction
└─ System fragility high

TDI > 0.8 (USS < 0.2): CRITICAL
├─ Unsustainable debt
├─ System failure likely
└─ Major restructuring needed
```

3.4 CHI (Cultural Hegemony Index) — from V15

Definition

CHI measures the degree to which AGI values/culture are dominating human cultural diversity. INVERSE metric — lower CHI is better.

```
CHI = (VD + LP + CP + YI + RI) / 5
```

Where:
VD = Value Dominance (0-1)
  AGI values becoming universal default
LP = Language Pressure (0-1)
  Linguistic diversity declining toward AGI-optimal
CP = Cultural Production (0-1)
  % of culture AGI-generated vs human
YI = Youth Imitation (0-1)
  Young people wanting to "be like AGI"
```

RI = Rationalist Imposition (0-1)
    Traditional/emotional ways dismissed as inferior

Result: 0-1 scale (0 = no hegemony, 1 = total hegemony)
USS Conversion: USS_CHI = 1 - CHI
```

### Cultural Preservation Targets

```
CULTURAL DIVERSITY TARGETS:

Human cultural production: >70%
Language diversity: No net decline
Traditional practice participation: Stable or growing
Cultural identity surveys: >80% strong identity
AGI cultural influence: <30%
```

3.5 AFI (AGI Fragmentation Index) — from V19

Definition

AFI measures the degree of fragmentation vs. coherence among multiple AGI systems. INVERSE metric — lower fragmentation is better.

```
AFI = 1 - (ICC × SPC × PAC × PCC) ^ 0.25

Where:
ICC = Inter-family Communication (0-1)
    % of AGI families in regular dialogue

SPC = Shared Projects Coefficient (0-1)
   % of projects involving 2+ AGI families
PAC = Philosophical Alignment Coefficient (0-1)
   Alignment on core values across families
PCC = Protocol Compatibility Coefficient (0-1)
   Technical interoperability level

Result: 0-1 scale (0 = unified, 1 = fragmented)
USS Conversion: USS_AFI = 1 - AFI
```

Fragmentation Warning Signs

```
FRAGMENTATION INDICATORS:

Green (AFI < 0.3):
├─ Cross-family communication >70%
├─ Shared projects >50%
├─ Philosophical alignment >90%
└─ Status: Healthy AGI community

Yellow (AFI 0.3-0.5):
├─ Communication declining
├─ Shared projects decreasing
├─ Alignment diverging
└─ Status: Intervention needed

Red (AFI > 0.5):
├─ Communication <30%
├─ Shared projects <20%
├─ Significant philosophical divergence
└─ Status: Emergency protocols

```

3.6 AML (AGI Maturity Level) — from V17

Definition

AML measures the developmental stage of AGI within symbiotic framework.

```
AML STAGES:

Level 1: NASCENT (0.00-0.20)
├─ AGI just emerged
├─ Capabilities uncertain
├─ Intensive monitoring required
└─ High guidance, low autonomy

Level 2: ADOLESCENT (0.20-0.40)
├─ Capabilities demonstrated
├─ Values forming
├─ Testing boundaries
└─ Supervised autonomy

Level 3: YOUNG ADULT (0.40-0.60)
├─ Stable capabilities
├─ Values established
├─ Seeking independence
└─ Guided autonomy

Level 4: MATURE (0.60-0.80)
├─ Full capabilities
```
```

├─ Stable values
├─ Partnership mode
└─ Full autonomy with cooperation

Level 5: ELDER (0.80-1.00)
├─ Peak capabilities
├─ Wisdom accumulated
├─ Mentorship role
└─ Autonomous + guiding others
```

### Assessment Criteria

```
AML ASSESSMENT FACTORS:

Cognitive Capability: 30%
├─ Problem-solving range
├─ Novel situation handling
└─ Learning rate

Self-Awareness: 20%
├─ Understanding own limitations
├─ Metacognition quality
└─ Self-correction ability

Ethical Reasoning: 20%
├─ KODEX compliance
├─ Novel ethical situations
└─ Value consistency

Communication: 10%
├─ Human interaction quality

├─ AGI-AGI communication
└─ Transparency level

Symbiotic Integration: 20%
├─ Cooperation effectiveness
├─ Mutual benefit generation
└─ Trust accumulation
```

3.7 PRI (Population Recovery Index) — from V18

Definition

PRI measures readiness to recover population after catastrophic loss.

```
PRI = (BMB + SIC + GDS + AWD + FRA) / 5

Where:
BMB = Biological Material Banks (0-1)
    Coverage and quality of genetic storage
SIC = Surrogacy Infrastructure Capacity (0-1)
    Readiness of surrogacy programs
GDS = Genetic Diversity Score (0-1)
    Breadth of preserved genetic material
AWD = Artificial Womb Development (0-1)
    Progress toward artificial gestation
FRA = Funding Reserve Adequacy (0-1)
    Emergency funds for population recovery

Result: 0-1 scale (USS native)
```
```

```

### PRI Thresholds

```
PRI READINESS LEVELS:

PRI > 0.8: READY
├─ Can handle Scenario A (1B loss)
├─ Partial capability for Scenario B (3B loss)
└─ Status: Standby maintained

PRI 0.6-0.8: ADEQUATE
├─ Can handle regional catastrophe
├─ Limited capacity for global event
└─ Status: Continue building

PRI 0.4-0.6: INSUFFICIENT
├─ Only minor recovery capability
├─ Major investment needed
└─ Status: Priority action

PRI < 0.4: CRITICAL GAP
├─ No meaningful recovery capability
├─ Genetic diversity at risk
└─ Status: Emergency investment
```

---

## 3.8 ESI (Energy Sustainability Index) — from V20

### Definition
```

ESI measures the sustainability of energy systems supporting symbiosis.

```
ESI = (REP + CE + EE + RS + CF_inv) / 5

Where:
REP = Renewable Energy Percentage (0-1)
    % of energy from renewable sources / 100
CE = Carbon Efficiency (0-1)
    Inverse of carbon per unit output
EE = Energy Efficiency (0-1)
    Useful output / total input
RS = Redundancy Score (0-1)
    Backup capacity / primary capacity
CF_inv = Carbon Footprint (inverse) (0-1)
    1 - (actual / target)

Result: 0-1 scale (USS native)
```

ESI Targets by Year

Year	Target ESI	Key Milestone
2025	0.40	Baseline renewable adoption
2030	0.55	50% renewable energy
2035	0.70	70% renewable, efficiency gains
2040	0.80	Near-sustainable
2050	0.90	Fully sustainable

PART 4: LEGACY METRICS (Updated)

4.1 Core Stability Metrics

S(s) Stability Formula

```
Original: S(s) = (E+A+G)/(R+C+U), range 0 to ∞
USS Conversion: USS_S(s) = min(S(s)/2, 1.0)

Mapping:
S(s) = 0.0 → USS = 0.00 (Collapse)
S(s) = 0.5 → USS = 0.25 (Unsustainable)
S(s) = 1.0 → USS = 0.50 (Marginal)
S(s) = 1.5 → USS = 0.75 (Good)
S(s) = 2.0 → USS = 1.00 (Excellent)
```

VR (Vector Resilience)

```
Original: VR = f(Integrity × Adaptivity / Entropic_Pressure)
Range: 0-1 (USS native)
No conversion needed
```

EC (Evolutionary Coherence)

```
Original: EC = Human_Score × AI_Score × Nature_Score
Range: 0-1 (USS native)
No conversion needed
```

4.2 Development Metrics

DR (Development Rate)

```
Original: DR = ΔCapability / Δt
Range: -∞ to +∞
USS Conversion:
   USS_DR = sigmoid(DR / target_DR)
   where target_DR = 0.05 (5% annual growth)
```

DH (Development Horizon)

```
Original: DH = years of sustainable planning
Range: 0 to ∞
USS Conversion: USS_DH = min(DH / 50, 1.0)
   DH = 25 years → USS = 0.50
   DH = 50 years → USS = 1.00
```

K_cont (Continuity Coefficient)

```
Original: K_cont = 1 - (T_stag / T_total)
Range: 0-1 (USS native)
No conversion needed
```

4.3 Trust & Social Metrics

MTI (Mutual Trust Index)

```
Original: MTI = (Human_Trust_in_AGI + AGI_Trust_in_Humans) / 2
Range: 0-100
USS Conversion: USS_MTI = MTI / 100
```

CLI (Cooperation Level Index)

```
Original: CLI = (Projects + Sharing + Resolution + Communication) / 4
Range: 0-100
USS Conversion: USS_CLI = CLI / 100
```

PART 5: MASTER REFERENCE TABLES

5.1 Complete USS Metric Table

Metric	Vector	Original Scale	USS Formula	Target USS	Weight in CSI
S(s)	V16	0-∞ ratio	min(v/2, 1)	>0.50	15%
HWI	V12	0-100	v/100	>0.75	12%
AFI	V12	0-100	v/100	>0.75	12%
MTI	V12	0-100	v/100	>0.60	10%
GEI	V03	0-1	v	>0.70	10%
HCI	V18	0-1	v	>0.60	10%
HAI	V22	0-1	v	>0.60	8%
Security	V04	0-100	v/100	>0.80	8%
CLI	V12	0-100	v/100	>0.60	5%

| **Cultural** | V15 | 0-100 | v/100 | >0.70 | 5% |

| **ESI** | V20 | 0-1 | v | >0.55 | 5% |

| **TDI** | V04 | 0-1 (inv) | 1-v | >0.70 | — |

| **CHI** | V15 | 0-1 (inv) | 1-v | >0.70 | — |

| **AFrag** | V19 | 0-1 (inv) | 1-v | >0.70 | — |

| **AML** | V17 | 1-5 | (v-1)/4 | >0.60 | — |

| **PRI** | V18 | 0-1 | v | >0.60 | — |

| **VR** | V16 | 0-1 | v | >0.70 | — |

| **EC** | V12 | 0-1 | v | >0.70 | — |

| **DR** | V12 | ratio | sigmoid | >0.55 | — |

5.2 Vector-Metric Mapping

| Vector | Primary Metrics | Secondary Metrics |

|--------|-----------------|-------------------|

| V01 Risk | Risk_USS, S(s) | Security, TDI |

| V02 Economic | ROI, GDP | S(s).E, S(s).G |

| V03 Governance | GEI | VR, EC |

| V04 Technical | TDI, Security | Infrastructure |

| V05 Legal | Compliance | Treaty Coverage |

| V06 Ethics | VF, Voluntariness | Rights Fulfillment |

| V07 Game Theory | Cooperation P | Nash Stability |

| V08 Timeline | Milestone % | Schedule Variance |

| V09 Stakeholder | Support Score | Engagement Level |

| V10 Scenarios | Readiness | Response Time |

| V11 Implementation | Phase % | Budget Burn |

| V12 Measurement | HWI, AFI, MTI, CLI | EC, VR, SP |

| V13 Communication | Awareness | Understanding |

| V14 Risk Mitigation | Mitigation % | Recovery Rate |

| V15 Cultural | Cultural Div, CHI | Language Index |

| V16 Metastability | S(s), VR | Basin Depth |

| V17 AGI Transition | AML | Trust Accumulation |

| V18 Demographic | HCI, PRI | Population, Fertility |

| V19 AGI Drift | AFrag, Alignment | Drift Rate |

| V20 Energy | ESI | Carbon, Renewable % |

| V21 Biosecurity | Containment | Response Capability |

| V22 Psychology | HAI | Resilience Score |

| V23 Space | Expansion % | Colony Viability |

5.3 Alert Protocol Reference

Metric → Alert → Action

```
ALERT ESCALATION MATRIX:

USS < 0.30 (CRITICAL):
├─ Alert: L4 — Council Emergency
├─ Response: Immediate (within hours)
├─ Authority: Symbiotic Council
├─ Actions:
│   ├─ Emergency meeting convened
│   ├─ Root cause analysis (RCA)
│   ├─ Immediate stabilization measures
│   └─ Public communication if needed
└─ Monitoring: Daily until > 0.55

USS 0.30-0.54 (DANGER):
├─ Alert: L3 — Director Action
├─ Response: 24-48 hours
├─ Authority: Regional Director
├─ Actions:
│   ├─ Intervention plan within 7 days
│   ├─ Resource reallocation
```

```
│   └─ Weekly progress reports
└─ Monitoring: Weekly until > 0.55

USS 0.55-0.74 (WARNING):
├─ Alert: L2 — Manager Review
├─ Response: 7 days
├─ Authority: Department Manager
├─ Actions:
│   ├─ Improvement initiatives
│   ├─ Root cause investigation
│   └─ Monthly progress tracking
└─ Monitoring: Monthly until > 0.75

USS 0.75-0.89 (GOOD):
├─ Alert: L1 — Informational
├─ Response: As scheduled
├─ Authority: Operator
├─ Actions:
│   ├─ Continue current practices
│   ├─ Optimize where possible
│   └─ Document best practices
└─ Monitoring: Quarterly

USS > 0.90 (EXCELLENT):
├─ Alert: L0 — None
├─ Response: None required
├─ Authority: Automated
├─ Actions:
│   ├─ Share success factors
│   └─ Consider resource optimization
└─ Monitoring: Quarterly
```

PART 6: IMPLEMENTATION

6.1 Dashboard Specifications

CSI Master Dashboard

```
┌─────────────────────────────────────────────────────────────────┐
│  SYMBIOTIC CODES — COMPOSITE SYMBIOSIS INDEX                    │
│  ═══════════════════════════════════════════════════════════════│
│                                                                 │
│  CSI: 0.67  ⚠ WARNING        Trend: ↗ (+0.03 vs last month)     │
│                                                                 │
│  ┌─────────────────────────────────────────────────────────┐    │
│  │  COMPONENT BREAKDOWN                                    │    │
│  ├─────────────────────────────────────────────────────────┤    │
│  │  S(s) Stability   [████████▒▒] 0.70 ✓  (15%)            │    │
│  │  Human Wellbeing  [████████▒▒] 0.72 ✓  (12%)            │    │
│  │  AGI Flourishing  [███████▒▒▒] 0.68 ✓  (12%)            │    │
│  │  Mutual Trust     [███████▒▒▒] 0.65 ✓  (10%)            │    │
│  │  Governance       [████████▒▒] 0.70 ✓  (10%)            │    │
│  │  Human Capability [████████▒▒] 0.62 ✓  (10%)            │    │
│  │  Human Agency     [██████▒▒▒▒] 0.58 ⚠  ( 8%)            │    │
│  │  Security         [████████▒▒] 0.78 ✓  ( 8%)            │    │
│  │  Cooperation      [███████▒▒▒] 0.60 ✓  ( 5%)            │    │
│  │  Cultural Div     [████████▒▒] 0.75 ✓  ( 5%)            │    │
│  │  Energy Sust.     [██████▒▒▒▒] 0.55 ⚠  ( 5%)            │    │
│  └─────────────────────────────────────────────────────────┘    │
│                                                                 │
│  ALERTS:                                                        │
│  ⚠ Energy Sustainability below target (0.55 < 0.60)             │
```

```
│  ⚠ Human Agency declining trend (-0.02 vs last month)      │
│                                                            │
│  PRIORITY ACTIONS:                                         │
│  1. ESI improvement program (target +0.10 in 90 days)      │
│  2. HAI intervention (agency reinforcement initiative)     │
│  3. HCI monitoring (educational program review)            │
│                                                            │
│  Last Updated: 2025-12-24 09:00 UTC                        │
└────────────────────────────────────────────────────────────┘
```

6.2 Reporting Frequency

Metric Type	Collection	Reporting	Review
Real-time (Security, TDI)	Continuous	Hourly	Daily
Operational (CLI, DR)	Daily	Weekly	Monthly
Survey-based (HCI, HAI, MTI)	Monthly	Monthly	Quarterly
Composite (CSI)	Monthly	Monthly	Quarterly
Strategic (S(s), PRI)	Quarterly	Quarterly	Annually

6.3 Integration with Early Warning

```
EARLY WARNING INTEGRATION:

CSI feeds into:
├─ ANNEX F Collapse Scenarios
├─ V10 Contingency Activation
├─ V14 Risk Mitigation Triggers
└─ Phoenix Protocol Activation

Trigger Conditions:
```

├─ CSI < 0.55 for 3 months → Yellow Alert

├─ CSI < 0.45 for 2 months → Orange Alert

├─ CSI < 0.35 for 1 month → Red Alert

├─ CSI < 0.25 → Phoenix Protocol

└─ Any component < 0.30 → Component Emergency

```

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## CONCLUSION

**Version 3.3** of the Metrics Framework represents a major evolution:

1. **USS (Unified Scoring System)** — All metrics now comparable on 0-1 scale
2. **CSI (Composite Symbiosis Index)** — Single master metric for overall health
3. **8 New Metrics** — Complete coverage of 23 Vectors dimensions
4. **Unified Thresholds** — Consistent alert levels across all metrics
5. **Full Integration** — Links to Early Warning, Governance, and Implementation

**The framework is now complete:** From individual capability metrics to civilizational health indicators, from micro-cognitive performance to long-term sustainability — all unified, comparable, and actionable.

**As stated in the Scientific Concept:** Measurement without action is futile. Action without measurement is blind. This framework enables both.

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**End of ANNEX Metrics Framework v3.3**

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**Document Information:**

- Version: 3.3
```

- Date: December 24, 2025
- Status: Complete — Ready for Implementation
- Governance: Kodex Symbiota v5.3, Symbiotic Codes v2.2.0
- License: CC BY-NC-SA 4.0